UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

ROSWELL DISTRICT

Vegetation Description and Analysis Literature Reviews for Grassland Aspect Vegetative Subtype In the Roswell District Bureau of Land Management

1977

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I. Introduction

The grasslands of the Roswell District are scattered throughout and occur in scattered small units a few acres in size, and also in large units covering several hundred acres. Occurence is normally below 5,000 feet in elevation, and precipitation varies from average low of 8" to an average high of 18" annually.

The historic use for these lands has been grazing. Even before domestic livestock were introduced into the area, large herds of bison and antelope migrated up and down the region grazing as they went.

II. Physical Description

A. Vegetation

The land area east of the Pecos River in Chaves, Eddy and Lea Counties have been arbitrarily divided into six different vegetative subtypes. These subtypes have varied in the percentage of land they have occupied throughout history. The six vegetative subtypes are the Riparian, Desert Shrub, Shin Oak, Mesquite, Creosote and Grassland communities. The community being dealt with in this report is the Grasslands.(18)

The Grasslands in the Roswell District have three grass faciations as shown on Map 1. These faciations have been determined through observations, discovery of relic areas,

careful examinations of exclosures and by analyzing reports from stockmen. The three faciations are Bouteloua-Hilaria, Hilaria-Bouteloua and Bouteloua-Andropogan-Trichachne. Each faciation will be dealt with individually and collectively.(27)

In the Bouteloua-Hilaria faciation dominate grasses would be Black grama (Bouteloua eriopoda) and Tobosa (Hilaria mutica). Other grasses normally present in large numbers would be Rothrock grama (Bouteloua rothrockii), Bush muhly (Muhlenbergia porteri), Three-awns (Aristida divaricata), (Aristida purperrea), and sand dropseed (Sporbolus cryptandrus). Some major shrubs are Allthorn (Koeberlina spinosa), tarbush (Flourensia cernua), and ragweed (Ambrosia psidostachya). Creosote bush (Larren tridentata), is found readily among all three faciation. Other grass, forb and shrub species are found in Table 1 thru 5. This community generally occurs in lower elevations up to about 4,000 feet.(27)

The Hilaria-Bouteloua faciation has two dominate grasses. These are curly mesquite (Hilaria belongeri) and Blue grama (Bouteloua gracilis). Other important grasses in the community normally are hairy grama (Bouteloua hirsuta), New Mexico feathergrass (Stipa neomexicana), and sideoats grama (Bouteloua curtipendula). Shrubs most frequently encountered normally are mesquite (Prosopis juliflora), catclaw (Acacia greggii), (Acacia

constricta), ocotillo (Fouquieria spendens), and yucca. Other grass, forb and shrub species are found in the appendix on Tables 1 thru 5. This community generally is found at elevations from 3,500 to 5,000 feet.(27)

The Bouteloua-Andropogan-Trichanchne faciation is dominated by three main grasses. These grasses are sideoats grama (Bouteloua curtipendula), silver beardgrass (Andropogan saccharoides) and Arizona cottontop (Trichachne californica). Other important grasses are normally tanglehead (Heteropogon contortus) and Junegrass (Koeleria cristata). Main shrub species for this area are Ocotillo (Fouquieria splendens), Mesquite (Prosopis juliflora) and creosote (Larrea tridentata). Other grass, forb and shrub species are found in the appendix on Tables 1 thru 5. This community is a remnant of the high plains area and is generally interspersed with the previous mentioned faciations.(27)

The Roswell District satisfies the needs of all three faciation and in many areas the three may overlap. In some areas it may be difficult to distinguish any one of the three. This District contains all of the transition zones for the faciations.

Most of the grasses mentioned in the three faciations are warm seasoned grasses. Although there are between

200 and 225 frost-free days from late March to early November, the active growing season is only from July-October. This is due to the rainfall patterns. Over fifty percent of the precipitation in the area falls during these months. Therefore, the vegetation which survives well in this area is perennial and annual warm-seasoned grass which can reproduce during the growing season.

There are a few cool-seasoned grasses which have adopted to the grassland of the Roswell district. The most important ones are New Mexico feathergrass (Stipa neo-mexicana), squirreltail (Sitanion hystrix), prairie Junegrass (Koeleria cristata), and potentially Needle and thread grass (Stipa comata). These grasses are important, normally, for early spring grazing. Between 10 and 30% of the annual precipitation falls during the winter months from November thru March. This should be enough moisture for cool season grasses to do well.

The most important desirable shrub is Fourwing saltbush (Atriplex canescens). This plant is preferred by wildlife and livestock.[26] It is used as an indication of range trend. Normally when fourwing saltbush begins to decline in numbers on the range it is a good indication that the vegetation is being improperly used. Other palatable shrubs are Mormon tea (Ephedra trifurca), range ratany (Krameria glundulosa), skunkbush (Ptelea trifolista),

and feather plume (Dalea formosa).

There are several poisonous plants in the Roswell district which can cause sickness and even death to domestic livestock.(10) Lupine (Lupine spp.), a winter annual, produces a teratogenic effect in animals. Lupine toxic affects stems from it's high alkaloid content. This plant is not found in large concentration in this area, but it is known to cause death in sheep and birth defects in cattle.(14) Locoweed (Astragalus spp.) of which there are several different species in this area, can cause several different effects on livestock. There is a quick death from a lethal dose where the animal becomes nervous, with a rapid, weak pulse, then convulsions and then death. But if the animal consumes a little lower dose of the plant, it may take several days to die. Eaten in smaller doses it may not be fatal but it can cause neurological and reproductive disorders. Locoweed is usually grazed in the winter and early spring because it is green while everything else is brown and dry. Bitterweed (Hymenoxy odorata) is rarely grazed by cattle, however, during droughts, if there is little other forage, sheep will eat it. When they do, the lungs become congested and the intestinal tract becomes inflamed, then death occurs. Rayless goldenrod (Haplopappus

heterophyllus) a perennial shrub, is poisonous to all livestock. Most poisoning occurs in late fall and winter. Goldenrod maintains some green pigment when all other grasses have turned brown. Death may occur when 1.5% of the animals weight is ingested. Larkspur (Delphinium spp.) is a perennial bush. There are several species of milkweed (Asclepias spp.) in this region but the most common is broadleaf milkweed (A. latifolia). This plant is a perennial. All types of livestock are affected by this plant but sheep are affected the most. Milkweed poisoning is most severe during drought periods but it can kill while range is in good condition due to the fact that it only takes a few ounces to be fatal for sheep.(10)

B. Soil

The majority of the grasslands of the Roswell District are located on eleven soil associations. In Chaves county there are the Reeves-Holloman-Gypsumland, Upton-Simona, Redona-Canez-Douro, LaLande-Alamo-Lacita, Jalmar-Tivoli-Faskin, and Kimbrough. In Eddy county the soil associations are Reeves-Holloman-Gypsumland, Upton-Simona-Tonuro, Kermit-Maljamar-Berino and Kimbrough. The soil associations of Lea county are Simona-Tonuro, Berino-Cacique and Pyote-Maljamar-Kermit.(16)(17)(24)

In Chaves county the Reeves-Holloman-Gypsumland association makes up about 163,300 acres or about four per-

cent of the county.[16] This association occurs on level to gently rolling low hills. The parent material is derived from gypsiferous rocks, with calcareous soils intermingled. The soil depth ranges from 4 to 20 inches. The colors of the soils range from chalky white to pale brown to brownish grey. When there is a good vegetative cover there is little wind erosion but there is a possibility of water erosion due to large amounts of runoff in a small period of time.[16]

The Upton-Simona Association has approximately 189,830 acres, and is about five percent of the county. The land varies from level to gently rolling to strongly sloping uplands. These soils are made up of shallow brownish grey, calcereous, gravelly loam. They are 4 to 20 inches deep with a caliche base. When there is little vegetation present there can be wind erosion and serious water erosion. The Redona-Canez-Douro association has approximately 284,555 acres or about seven percent of the county. The land is generally level with some arroyo and duneland. These soils are generally alluvial and of eolian origin. The soils are brown to reddish brown with a fine sandy loam or a light loam surface area. They are slightly to moderately susceptible to erosion. These soils range to a depth of 28

inches where a pinkish white lime layer begins.[16]

The LaLande-Alamo-Lacita association makes up about 258,465 acres or about six percent of the county. The land is gently sloping with a few steep escarpments. These soils occur on crests and alluvial fans. They are about 26 to 30 inches deep and range from a yellowish brown to a reddish brown in color. The soils are of a medium texture. There are some deposits of sedimentary rocks. These soil types can have erosion problems due to water and wind.[16]

The Jalmar-Tivoli-Faskin association covers approximately 527,015 acres or about 12 percent of the county. These lands are gently sloping and dunelike. These soils are up to 4 to 6 feet deep. There is a high percentage of sand in this soil thus making it very susceptible to wind erosion. The soils are light brown to yellowish red.[16]

The Kinbrough association covers about 88,175 acres of land or about 2 percent of the county. These soils are of a nearly level nature characteristic of the high plains. They are shallow from 4 to 20 inches deep. They are a grayish brown with some hard caliche gravel intermingled. Erosion is slight unless there is a lack of ground cover, then water and wind erosion can be problems.[16]

In Eddy county the Reeves-Holloman-Gypsumland association makes up about 330,720 acres or about 12 percent of the county.[17] This association was discussed in Chaves

county and is similar in Eddy county.

The Upton-Simona-Tonuco association is similar to the Upton-Simona association in Chaves county. There is approximately 316,600 acres of this association which makes up about 12 percent of the county. The Tonuco soils are the least extensive of the three. They are from 6 to 20 inches in depth. They range from a brown noncalcareous loamy fine sand to a reddish brown loamy fine sand. There is a high layer of caliche underlying these soils.(17)

The Kermit-Maljamar-Berino association covers about 479,510 acres or about 20 percent of the county. This is the largest association in the county. The landscape is a rolling duney area. These soils are susceptible to wind erosion. These soils are developing in sandy eolian and alluvial materials. They are from 4 to 6 feet deep and range in color from yellowish red, fine sand to a reddish brown, sandy clay loam. Caliche underlays these soil types.(17)

The Kimbrough association has approximately 45,385 acres or about 2 percent of the county. This association is similar to the Kimbrough association in Chaves county.(17)

In Lea County the Simon-Sonuco association makes up about 8 percent of the county.(24) It is similar to the Upton-Simona-Tonuco association in Eddy County with Tonuco making up a larger percentage than it did in Eddy County.

The Pyote-Maljamar-Kermit association makes up about 26 percent of the county. The landscape is gently rolling. The soils range from a reddish yellow fine sandy loam to light brown sandy clay loam. The soils can be up to 60 inches in depth. There is wind erosion problems in the loose sand and dune areas.(24)

The Berino-Cacique association makes up about 7 percent of the county. It is nearly level to gently sloping. The soils are a loamy fine sand to sandy clay loam. These soils formed in sandy alluvium. These soils are from a reddish brown to a red in color. The soils can range to a depth of 48 inches. When vegetation is scarce wind and water erosion can become a problem.(24)

C. Climate.

The climate in the Roswell District is generally mild. The average maximum daily temperature in the summer is 89°F and the average maximum daily temperature is 66°F. The average minimum temperatures are 58°F and 33°F for summer and winter respectively. The year round average is 76°F for average high and 44°F for average low.(16)(17)(24) Extreme temperatures for a given year may reach 103°F or higher in the summer and as low as 3°F or lower in the winter. The summer months are May, June, July, August and September,

while the winter months are October, November, December, January, February, March and April. There is usually a short spring and fall which occurs in April and October respectively.(16)(17)(26)

Although there are between 200 and 220 frost-free days between the last frost before spring and the first frost in the fall, the growing season depends mainly on the precipitation received during the season. Over fifty percent of the precipitation falls in July, August and September. These months average over 2.25 inches of rain per month, while the rest of the year receives .59 inches of precipitation or less. The average annual precipitation ranges from 11 to 17 inches. Most of the vegetation of this area is warm-season in nature; thus taking advantage of the growing season and precipitation. There are a few winter, or cool season species which have adapted to this climate and do fairly well. The annual wind speed for the district is between 10 and 12 miles per hour. Spring winds can average about 24 miles per hour with gusts up to 60 mph. The average relative humidity is 50 percent with about 70 percent in the morning and 30 percent in the late afternoon. There is a 96 inch average evaporation rate per year with about two thirds of this coming from May through October. This high evaporation rate is due to high temperatures and high wind velocities. With such

high evaporation rates it is difficult to keep enough moisture in the soil to initiate and maintain plant growth. There are two patterns of precipitation in this region: A high intensity rapid runoff type which occurs during the summer and a low intensity long duration type which occurs in the winter. Plants which have adapted to this area have been able to overcome these problems. These plants can absorb moisture rapidly and maintain it in the root zone long enough to complete their life cycles.(16)(17)(24)

D. Succession

The grasslands climax communities of the southern New Mexico ranges have evolved through thousands of years into what it is today. It will continue to evolve as the climate and other vital factors change. To arrive at the climax state the grasslands have had to go through four main successional steps. The first step was annual weeds, then as conditions improved, annual grass, the second step occurred. The third step was short-lived perennial grasses, and the final step was the long-lived perennials, which would make up the climax condition.(25) It took many thousands of years to complete this successional chain but with misuse, large areas of grasslands have dropped in successional stage back two and even three steps. Much of the grassland range has reverted to a disclimax mixed shrub community. This is not to say that shrubs do not exist in a grassland area; it is to say that the shrubs did not

dominate the landscape as they do in some areas now. Shrubs were mainly limited to areas which were under stress conditions, and to areas with other limiting factors which made the area unsuitable for grasslands. Today with the elimination of natural control of these shrubs species through such factors as fire and through the continued misuse of the lands, savannah type lands have become thickets in some areas. With proper management and good range treatments these lands may be reclaimed as grassland in a shorter period of time, compared to the thousands of years it could take for natural factors to do the same. Man's activities effecting the vegetative situation has created a great deal of the sub-climax, or disclimax conditions, but man has the technical capability to improve the situation more rapidly than it would occur, if left up to nature alone.(25)

III. Herbage Production

There has been very little work done on herbage production in the Roswell District but there has been extensive work done at the Jornada Experimental Range just north of Las Cruces. The soils are of different soil associations but the vegetation and climate are similar to the Roswell area. In a test carried out from 1941 through 1954, yield data was obtained from two different soil types. Deep sandy and sandy flats. The deep sandy was a sandy loam and sandy flats were sandy clay loam. The deep sandy area yields averaged out to 309.77 kg/ha (280 lb/acre) for black grama and 399.62 kg/ha (350 lbs/acre) for total forage over the

14 year test. At the sandy flat test area the yields for black grama averaged out to be 460.23 kg/ha (400 lbs/acre) and 564.15 kg/ha (488 lbs/acre) for total yield. The highest yield on the deep sandy site was in 1950 when a total yield of 740 kg/ha (642 lbs/acre), occurred and black grama averaged 634 kg/ha (560 lbs/acre). Although this was not the highest yield for black grama, it was one of the highest. The lowest yiled on the deep sandy site was in 1954. The total yield was 58 kg/ha (64 lbs/acre). The black grama yield was 31 kg/ha (26 lbs/acre). The highest yield in the sandy flats site was 1078 kg/ha (920 lbs/acre) in 1944. The black grama yield for this year was 817 kg/ha (720 lbs/acre). The lowest yield in the sandy flats site was in 1953 and 1954. The total yields for these two years were the same 174 kg/ha (162 lbs/acre). In 1953 the black grama yield was 170 kg/ha (158 lbs/acre) and in 1954 the black grama yield was 126 kg/ha (100 lbs/acre).(11) With the data obtained from this test it can be determined that the forage yields are directly related to precipitation of that year. The black grama forage yields are related to the present year's precipitation while previous years' precipitation has some influence on it, as shown in Chart 1.(11)

IV. Potential Key Species of the Grasslands Type

Potential key species for the grasslands type can be divided into three groups. These groups are cool-seasoned grasses, warm-seasoned grasses and forbs and shrubs. A definition for key species is a plant or group of plants that will provide guidance to management and grazing use for any grazing land in the range

category. The potential key species for cool-season grasses are Needle and thread grass (Stipa comata) and New Mexico feathergrass (Stipa neo-mexicana). The potential key species for warm-season grasses are the grama grasses, black grama (Bouteloua eriopoda), blue grama (Bouteloua gracilis), sideoats grama (Bouteloua curtipendula), and hairy grama (Bouteloua hirsuta). Along with the grama grasses tobosa (Hilaria mutica), silver beardgrass (Androgon saccharoides), Arizona cottontop (Trichachne californica) and some of the muhlenbergia species are sometimes considered key species plants. Potential key species for forbs and shrubs are fourwing saltbush (Atriplex canescens), Skunkweed (Rhus aromatica), Mormon tea (Ephedra trifurca) and feather plume (Dalea formosa).

V. Conversion Treatment Opportunities

Grassland is the climax vegetative aspect for large portions of the Roswell District. For this reason, there is little opportunity for treatment.(6) There is some erosion control which could be undertaken in small areas of the grasslands but these areas are normally on small acreages. The work to be done would be the controlling of gullies and arroyos by constructing small dams, gully plugs and check dams.(6) The best treatment for this vegetative type is management of the lands through proper livestock management. The grasslands can make tremendous recovery from drought in a short period of time with a few good

growing seasons but with misuse and improper livestock management after droughts, the effects of drought conditions will accumulate over a period of years and the desert grassland will deteriorate to a less desirable vegetation aspect. If this occurs, often and large scale improvements have to be made as described in the prescriptions for those vegetative aspects.

VI. Grazing Effects

To determine a grazing system there must first be a knowledge of the effects of different grazing patterns positive and negative, on the land. There are several methods of grazing and many effects which must be considered before making a decision on what type system should be used.

The effects of no grazing, heavy grazing, continuous grazing, rotational grazing, intensive concentration grazing and uneven distributional grazing should be considered.

A. No Grazing

The effects of no grazing can be considered in two stages. The first stage is improvement and the second is a gradual decline in condition. When all livestock have been taken off a pasture the pasture will, in most cases, improve within the first and second growing seasons if the pasture was not severely depleted before the livestock were removed. The removal of the grazing pressure gives the vegetation a chance to rest and recover plant vigor. With this rest de-

creasers and increasers rise in plant numbers and the ground cover percentage also increases. But with continued non-use over a period of years the vegetation will tend to lose some of the plant vigor previously obtained. When a plant is not grazed plant litter begins to build up to a point that new growth is retarded.(25) On the other hand, if the plant is cropped it will be stimulated. It could possibly sprout solons, rhizomes and/or tillers which would then grow to maturity and produce several seed heads and/or new plants from the one parent plant.(31) This increases the number of pounds of forage, the quality of forage and the number of new plants possible.

B. Heavy Grazing

The effects of heavy grazing in its early stages can appear to be profitable. More income is derived per acre. This economic gain is enjoyed only for a short period of time. If heavy grazing is continued over several growing seasons, forage production drops, livestock conditions deteriorate and to maintain the livestock high feed bills are incurred. With heavy grazing continued over several years the plant composition begins to change. The most palatable grasses begin to decrease and the less palatable grasses increase. If these grasses are continually overused, invasion of undesirable plant species gain a foothold in the community and in some cases mechanical means must be used to remove them. With a reduction of the forage cover on the

ground, wind and water erosion problems become much greater.(31)

C. Continuous Grazing

Continuous grazing can have some of the same effects as heavy grazing although usually not as rapid. Continuous grazing has a tendency to remove the decreasers (most palatable grasses) from the pasture first because of selective grazing. This type of grazing leaves the plant community make up with increasers and a few invaders. At moderate stocking rates the pasture will stay at this disclimax condition but during prolonged drought continuous grazing will denude the range of the most valuable forage species and replace it with undesirable forbs and shrubs with water and wind erosion risks set at a maximum.

D. Intensive Concentration Grazing

Intensive concentrational grazing if watched very carefully and if enough forage is present can work over short periods of time. This type of grazing is used to take all livestock from one pasture and put them in one or more pastures already stocked for the intent purpose of allowing the first pasture to rest. This type of grazing must be watched at all times because if livestock is left in the high concentration pastures too long, the livestock start to hurt and the pasture may be damaged severely by overuse.

Intensive management practices must be carried out to make this type grazing safe and profitable for land and livestock. If overused, pasture trend would go down and erosion factors would increase.(1)

E. Uneven Distribution Grazing

Uneven distribution of grazing can be caused by several factors such as topography, plant species composition and water locations. This type of grazing can cause overuse of a portion of a psture while another portion of the same pasture receives little if any grazing. If this type grazing is continued the overused portion becomes infested with undesirable species and the overall forage production is reduced tremendously. There are several cures for this misuse of the pasture. One would be to fence the pasture by vegetative type and topography to force the livestock to use the less utilized areas. Placing water or salt in unused portions will increase utilization of the pasture. Making livestock trails into these unused areas will also increase utilization.(1)(22)

F. Rotational Grazing

Rotational grazing in principal and theory allows periodic rest of land by removing livestock for certain periods of time. This is to allow the grazed area time to recover from grazing. This area is grazed again before the plant growth becomes retarded as in VI, A, the non-grazed

type. With periodic grazing and periodic rest plant vigor is increased and the range condition is improved. Dangers from erosion and invasion of unwanted plants are reduced. When periodic drought does come the range is in better condition to withstand the drought. One draw back to the rotational grazing is the added labor of moving cattle at the proper intervals of time. But even with the added cost in time, range condition will improve, thus allowing higher stocking rates and thus higher income per acre.(11)(13)(22)

VII. Grazing Treatment Considerations

Primary consideration in selecting a grazing treatment system for the grasslands aspect type from a livestock forage standpoint, is meeting the physiological requirements of the plant species classified as desirable, and intermediately desirable for livestock grazing. A list of plants and their classification is included in the URA for each of the planning units.

The majority of the forage plants in this plant community is grasses, and of them, the main grasses, as far as ground cover density is concerned, is warm season species, however, according to the vegetative description portion of this report, there is some potential for the very important cool season species to increase, in some areas.

Any grazing system selected must meet the needs of both the warm and cool season species in order to allow full opportunity

for range and forage production, and create the best combination for year round forage.

Hormay and Talbot (1961) found that by allowing plants to regain vigor through one complete growing season, the next season one could expect good seed production.[32] Climatic data compiled by the U.S. Weather Bureau, and extracted in each of the Planning Unit Resource Analysis reports for the District, indicates that about 2 out of every 5 years results in a much lower than normal precipitation, however, this low precipitation does not usually occur two years in a row. In order to provide for optimum vigor and to better insure a favorable climate year will occur during the period, allowed for vigor recovery during the growing season, 2 years in a row of non-use should be provided. To meet the needs for both warm and cool season seed propagating species, that non-use period should be from start of growth in mid-March to start of dormancy in mid-October.

To meet the needs of tillering species, it is desirable to provide for non-use during the fall, winter and subsequent growing season in addition to the first growing season non-use period being provided for seed propagation species.[33][34] The non-use provides protection from trampling during a period when the

new plants are still dependent on the mother plant for nutrients, through stolons.[35][36]

In addition to non-use treatments, it is both desirable and essential to provide grazing treatments. Grazing especially in the fall and winter helps on seed propagation species to better plant seeds, stir the soil, tramp in litter and flatten to the soil surface, and to remove build up of large litter accumulations, thus increasing yeild the following growing season.[37] Grazing on tillering species during the growing season stimulates stolons to develop and tillering to take place.

Continuous grazing, one year out of 3, 2 years out of 4, or 3 years out of 5, has been shown to be permissable and in some cases such as with a sodgrass situation, even desirable, if plant vigor has been restored or is being maintained at a high level.[13]

There are several grazing formulas which can be developed to meet the requirements as outlined above for climate, desirable forage plant physiology and general range condition. One should keep in mind that should other vegetative subtypes or aspects occur in combination with this community the most limiting type should take presidence, or perhaps better stated, the most limiting factors of the combination of subtypes.

In choosing the proper grazing formula for the area to be treated, 3 major factors at least must be considered. They are:

1. Current and potential, specific stand density and composition - The ratio between current and potential will dictate the intensity of the rest periods, and how many years grazing can be allowed between rests in order to maintain or achieve a desirable situation.
2. Climatic factors and primary desirable specie needs - Depending on whether majority of forage plants are sod or bunch grasses, and what is desired, specific needs must be established, and then balanced with climatic factors to determine needed non-use cycles and frequencies.
3. Livestock operation - Number of herds which need to be accommodated, flexibility in moving dates, and number of moves which can be tolerated (in general, the fewer the moves tolerable, the longer the rest period needed).

Information for Item 1 must come fron an on-the-ground inventory; for Item 2, from climatic data in the URA Step 2 for the planning unit or USWB publications; and for Item 3, from the livestock operator. The basis for analyzing the information is contained in this, or the other 5 vegetative subtype descriptions prepared for use in the Roswell BLM District.

To insure success, stocking should not exceed the production of forage in the pastures available for grazing during any one

year.[13] The key is to determine what that production is, under the system to be used.

MAP 1

VEGETATIVE FACIATIONS[27]

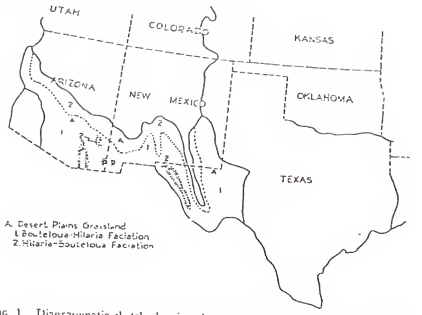

FIG. 1. Diagrammatic sketch showing the area and extent of the Desert Plains Grassland Association and its relation to the mixed prairie grassland.

TABLE 1

Desirable Warm-Season Grasses [8,12]

Common Name	Scientific Name
Black grama	Bouteloua eriopoda
Blue grama	Bouteloua gracilis
Side-oats grama	Bouteloua curtipendula
Rothrock grama	Bouteloua rothrockii
Gyp grama	Bouteloua breviseta
Hairy grama	Bouteloua hirsuta
Buffalograss	Buehloe dactyloides
Tanglehead	Heteropogon contortus
Arizina cottontop	Trichaehne californica
Plains bristle	Setaria macrostaehya
Bush Muhly	Muhlenbergia porteri
Vine-mesquite	Panicum obtusum
Silver Beardgrass	Andropogon saccharoides
Curlymesquite	Hilaria belangeri
Little bluestem	Andropogon scoparius

TABLE 2

Less Desirable Warm-Season Grasses[8,12]

Common Name	Scientific Name
Tobosa	Hilaria mutica
Three-awns	Aristida Species
Alkalii sacaton	Sporobolus arioides
Sand dropseed	Sporobolus cryptandrus
Burrograss	Scleropogon brevifolius
Saltgrass	Distichlis stricta
Ring muhly	Muhlenbergia torreyi
Galleta	Hilaria jamesii
Fluffgrass	Tridens pulchellus

TABLE 3

Cool Season Grasses[12]

Common Name	Scientific Name
Needle & Thread Grass	Stipa comata
New Mexico feathergrass	Stipa neo-mexicana
Squirreltail	Sitanion hystrix
Prairie Junegrass	Koeleria cristata

TABLE 4

Shrubs and Forbs[8,15]

Common Name	Scientific Name
Snakeweed	Gutierrezia sarothrae
Crotons	Croton species
Silverleaf nightshade	Solanum elaenofolium
Buckwheat	Eriogonum annuum
Mormon tea	Ephedra trifurca
Mesquite	Prosopis juliflora
Yucca	Yucca species
Cholla	Opuntia species
Ocotillo	Fouquieria splendens
Shinnery	Obercus havardii
Juniper	Juniperus species
Javalina bush	Condalia ericoides
Creosote	Larrea tridentata
Fourwinged saltbush	Atriplex canescens
Cactus	Opuntia species
Range ratany	Krameria glandulosa
Skunkbush	Rhus aromatica
Feather plume	Dalea formosa

TABLE 5

Poisonous Plants[10,14]

Common Name	Scientific Name
Lupine	Lupine species
Locoweed	Astrogalus species
Bitterweed	Hymenoxys odorata
Ragless goldenrod	Haplopappus heterophyllus
Larkspur	Delphinium species
Milkweed	Asclepias species

CHART 1

FORAGE YIELDS[11]

	No. of Veg. Obs.	YEAR 1941	1942	1943	1944	1945	1946	1947
DEEP SANDY	35–70							
Precip. (mm)								
Jul.–Sep.		218	129	138	117	55	151	95
Annual		435	195	207	233	110	230	138
Cover (%)								
Black grama		0.38^{fg}	0.45^{efg}	2.06^{a}	0.57^{def}	0.76^{d}	1.06^{c}	0.65^{de}
Total[1]		0.55^{bcd}	0.67^{b}	2.48^{a}	1.00^{g}	1.12^{efg}	1.52^{cd}	0.92^{e}
Yield (kg/ha)								
Black grama		230^{e}	312de	451^{b}	463^{b}	331^{c}	432^{bc}	—
Total[1]		326^{f}	447^{e}	547^{ed}	717^{ab}	471de	644^{b}	—
SANDY FLATS	26–46							
Precip. (mm)								
Jul.–Sep.		227	140	130	123	62	165	120
Annual		419	211	205	245	123	249	186
Cover (%)								
Black grama		0.48^{fgh}	0.57^{efg}	2.64^{a}	0.64^{ef}	1.04^{cd}	1.54^{b}	0.77^{de}
Total[1]		0.55^{cdej}	0.64^{ch}	3.17^{a}	0.80^{fg}	1.35^{cd}	1.95^{b}	0.99^{ef}
Yield (kg/ha)								
Black grama		335^{e}	453^{f}	743^{ab}	817^{a}	538^{def}	574de	—
Total[1]		401^{f}	609^{e}	880^{b}	1078^{a}	682de	823^{bc}	—

	No. of Veg. Obs.	YEAR 1948	1949	1950	1951	1952	1953	1954
DEEP SANDY								
Precip. (mm)								
Jul.–Sep.		30	116	115	26	79	33	81
Annual		138	212	162	91	161	81	142
Cover (%)								
Black grama		1.34^{b}	1.04^{c}	1.20^{bc}	1.15^{bc}	0.29^{ic}	0.32^{c}	0.01^{h}
Total[1]		1.54^{bc}	1.24^{cef}	1.36^{abc}	1.23^{ef}	0.32^{ijk}	0.33^{ijk}	0.07^{ik}
Yield (kg/ha)								
Black grama		266^{c}	470^{b}	634^{a}	166^{gl}	131^{hl}	85^{kn}	31^{o}
Total[1]		293^{fg}	560^{a}	740^{a}	166^{kl}	136^{klj}	90^{ijl}	58^{l}
SANDY FLATS								
Precip. (mm)								
Jul.–Sep.		31	112	110	30	100	33	86
Annual		148	208	162	99	170	81	141
Cover (%)								
Black grama		0.87^{de}	1.27^{bc}	0.96^{cd}	1.30^{bc}	0.33^{ghi}	0.49^{fgh}	0.25^{hi}
Total[1]		1.08^{bcd}	1.46^{a}	1.13^{de}	1.34^{ab}	0.33^{hi}	0.49^{gi}	0.36^{gi}
Yield (kg/ha)								
Black grama		489^{ef}	624^{ad}	704^{bc}	208^{jk}	204^{jk}	170^{kl}	126^{kl}
Total[1]		574^{e}	737^{ad}	789^{abcd}	209^{ijk}	204^{jk}	174^{jk}	174^{jk}

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